

TERMÍN: 07.11.2020

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Recenzia B
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*Prosím nezasahujte do tejto tabuľky*RECENZENT/KA (meno a priezvisko, pozícia, inštitúcia): **Martin Feješ**NÁZOV MATERIÁLU: **Structural macroeconomic model of Slovakia**TYP VÝSTUPU\*[1]: **Analýza**

(pri spoločných výstupoch uviesť aj typy individuálnych vkladov):

ANALYTICKÝ ÚTVAR, REZORT: **Ministerstvo financií SR - Inštitút finančnej politiky**AUTORI/KY: **Richard Priesol;**

SPOLUAUTORI/KY: - - ; - - ; - - ; - -

RECENZNÝ FORMÁT\*[2]: **2****PRIPOMIENKY:**

P.č	Pripomienka sa vzťahuje k (strana, odsek):	Text pripomienky*[3]	Odôvodnenie pripomienky	Vysporiadanie sa s pripomienkou*[4]
1	s. 14, odsek 1	Households block and disposable income	Property income and other current transfers appear within the structure of disposable income as exogenous variables, together representing approximately 10% of household's income and 20% of household's	I linked the property income and the current transfers of households to a gross domestic product in nominal terms.

			expenditure. Would it be possible to shed more light on the way these exogenous items are predicted in medium-term horizon? Alternatively, as a more elegant solution, I recommend linking the mentioned items to a suitable base.	
2	s. 15, odsek 4	Default fiscal strategy is based solely on public expenditures.	I think it would be appropriate to discuss in more detail, why the fiscal response function does not work within revenue items either. Isn't the model impoverished?	<p>Fiscal rules are based on an expenditure side of a public budget, in line with Claeys et al. (2016), Darvas et al. (2018) and Feld et al. (2018).</p> <p>We prefer expenditure over revenue components of a public budget with a respect to more convenient fiscal multipliers and a policy focus on expenditure ceilings, as proposed by Šuchta et al. (2018).</p>
3	s.34 - 37	Fiscal reaction function	It follows from the specification of equations containing the fiscal reaction function that this function acts permanently, which I assume is not desirable when making a forecast. In this case, the possibility of choosing the channel, through which any deviations	To overcome issues with the budgetary plan and provide macroeconomic forecasts that are consistent with fiscal variables, we implement a two-step estimation

			<p>from the targeted debt or deficit will be consolidated, should be maintained. In particular equations I recommend introducing a dummy variable used to enable or disable the given channel of the fiscal reaction function.</p>	<p>process that is based on a proportional fiscal consolidation.</p> <p>In the first step, we turn off fiscal rules and forecast model variables with no fiscal restrictions to obtain a baseline forecast of the domestic economy.</p> <p>In the second step, we target a structural balance from the budgetary plan under a proportional fiscal consolidation that is then distributed between <b>public revenues (50%)</b> and expenditures (50%), in line with historical shares of particular budgetary components.</p>
4	s. 20, odsek 1	Shock definition – one-off/permanent.	In chapter 6, I recommend to clearly state whether a one-off or permanent shock is used to evaluate features of the model.	Both macroeconomic and fiscal shocks are set as permanent in the model.
5	s. 20, odsek 1 s. 55 - 70	IRF definition.	“Impulse response functions are proposed as percentage deviations from baseline values.” From IRFs figures (e.g. total	Impulse response functions are presented

			external demand shock), I would intuitively say that figures show the deviations from baseline growth. (E.g. if there were deviations from baseline levels, the reaction of output would be approximately the same as output gap as the potential output almost does not change). I recommend checking all IRF figures or changing the definition of IRFs in chapter 6.	as percentage deviations from baseline growth rates.
6	s. 20, odsek 1 s. 55 - 70	Is the fiscal reaction function switched on or off when simulating shocks?	According to the specification of equations fiscal reaction function is permanently active. On the other hand, responses of debt and balance are smooth and long-lasting. One would expect that these variables should turn back to baseline steady state more significantly due to active fiscal reaction function.	We do not switch off fiscal rules in neither the impulse response analysis nor estimation of fiscal multipliers. Our results should be thus viewed as an empirical rather than an undisturbed impact of macroeconomic and fiscal shocks on the domestic economy.  On the other hand, we allow for a relatively mild reaction of the fiscal rules to limit their impact on the impulse response functions. As a result, the impulse response

				functions of debt and balance are smooth and long-lasting.
7	s. 55 - 56	Total factor productivity IRF	The IRFs for TFP and external demand are very similar, although these shocks are fundamentally different (supply vs. demand shock). One would expect that a shock to TFP will cause companies to produce more efficiently and at lower labor costs leading to an unemployment increase. This should have a dampening effect on price development. Also, the effect on the economic activity should not be greater than on potential product and thus the output gap should be reduced, which should also have a deflationary effect on prices.	I corrected a definition of the model to produce more intuitive impulse response functions to a productivity shock. Output gap is negative in the first year and output prices decline in the first quarter. Finally, domestic employment declines in the first year.
8	s. 61	Oil price shock responses.	Regarding oil price shock there is a positive impact on GDP in first 3 quarters perhaps due to quite strong reaction of imports via price channel. Could you please explain such a development?	I corrected a definition of the model to produce more intuitive impulse response functions to an oil price shock. Domestic output declines in the first quarter.
9	s. 34 - 35	Government wages as explanatory variable in corporate investment equation.	What is the reason behind incorporating government wages as explanatory variable into corporate investment	Government wages enter corporate investment as both a cost item in an

			<p>equation once it includes operating surplus term and thus wages already act as a cost item (see operating surplus and mixed surplus identities)? Now it seems that there is a double counting effect of government wages.</p>	<p>operating surplus and as a fiscal variable to capture market expectations about a fiscal policy and their impact on a confidence of investors. Specifically, we assume that unproductive consumption and transfers have a negative impact on market expectations and thus result in a decline of private investment.</p>
10	s. 34	Corporate investment and corporate employment equations.	<p>In corporate investment and corporate employment equations using value added as explanatory variable instead of GDP is recommended.</p>	<p>The approximation of a domestic demand with a gross domestic product provides a better fit of historical data than the approximation with a gross value added for both domestic investment and domestic employment.</p>
11	s.35	Corporate wages equation.	<p>In corporate wages using labour productivity in private sector (value added to employment in private sector) as explanatory variable instead of productivity of entire economy is recommended.</p>	<p>Specification with a labour productivity of the domestic economy, e.g. a domestic output over domestic employment, provides a better fit of historical data with a respect to a labour</p>

				productivity of the private sector, e.g. a domestic output over private and personal employment.
12	s. 34	Capital stock equation.	Two different equations for capital stock are provided in the list of model equations.	I corrected a definition of a capital stock and a depreciation rate.
13	s. 35	The Marshall-Lerner conditions.	The Marshall-Lerner conditions may not apply in foreign trade equations (the sum of exchange rate parameters in export and import equations is $<1$ ). Real depreciation will improve the foreign trade balance less than its nominal deterioration due to a change in terms of trade. However, the transfer of foreign prices to domestic ones is not complete.	We need to mention that a sum of exchange rate components in export and import equations is less than one and thus violates the Marshall-Lerner conditions.  However, since only a part of an export deflator ( $px_t$ ) is driven by domestic prices and only a part of an import deflator ( $pm_t$ ) is driven by external prices, in contrast to standard assumptions, the Marshall-Lerner conditions do not need to hold to obtain plausible simulation results.

14	s. 17	Model convergence.	Together with the steady state share of investment to GDP (approx. 22 %), it would be interesting to see also the share of remaining GDP components. Alternatively, I recommend analyzing the topic of the model convergence within an isolated chapter/subchapter. Some graphics of model convergence would be motivational.	I added a subsection of model convergence with steady-state values of the output components and graphics of the model convergence.
15	s. 18	Model calibration and fiscal multipliers.	The parameters affecting the fiscal block are calibrated and thus the fiscal multipliers do not have to be the result of the observed economic data, but rather the author's opinion. I propose to add a tabular comparison of available estimates of fiscal multipliers for the Slovak Republic.	I added a comparison of fiscal multipliers from different studies of the Slovak Republic.
16	s. 38 - 54	Estimation outputs.	Please check if all estimation outputs are included. At least 3 equations of sectoral investment are missing.	I added estimation outputs for missing equations.
17	s. 29 - 33	List of model variables.	Instead of dividing the list of model variables by model blocks, I would prefer one overall list with variables in alphabetical order, placing the parameters marked with Greek letters at the top of the	I prefer a division of model variables by model blocks but restructured the model variables to correspond to the model blocks.



			list. In the current list, some variables do not correspond to specific blocks.	
18	s. 30	Model variables explanation.	What is the difference between the variables Dtp and Dlp (both are referred to productivity differential)?	<p>Dtp corresponds to a differential of a factor productivity that enters domestic export.</p> <p>Dlp corresponds to a differential of a labour productivity that enters consumer prices.</p>
19	s. 61	Figures for oil price shock.	Figures for oil price shock are placed among the fiscal shocks. I recommend moving it to macroeconomic shocks.	I placed impulse response functions in a more intuitive order.

## 2021\_04\_09 Follow-up comments

P.č	Pripomienka sa vzťahuje k (strana, odsek):	Text pripomienky*[3]	Odôvodnenie pripomienky	Vysporiadanie sa s pripomienkou*[4]
1	p. 14-15	<p><u>Follow-up on initial comment #2:</u> Fiscal rules are based on an expenditure side of a public budget.</p>	<p>Expenditure over revenue components of a public budget with a respect to more convenient fiscal multipliers are preferred, whereas in the second step of estimation process you target a structural balance from the budgetary plan under a proportional fiscal consolidation that is then distributed between <b>public revenues (50%)</b> and expenditures (50%), in line with historical shares of particular budgetary components.</p> <p>At this point it sounds confusing to me. On the one hand you talk about consolidation exclusively through expenditures, but on the other hand revenue items are used for consolidation when making the forecast?</p>	<p>We prefer expenditure over revenue components of a public budget, due to a simple practical implementation and plausible stabilization properties of the model. Furthermore, the expenditure components produce more convenient fiscal multipliers with a respect to the revenue components. Finally, a fiscal policy based on expenditure components of a public budget is more consistent with a policy focus on expenditure ceilings of Šuchta et al. (2018).</p>

				<p>Even though we prefer fiscal rules that are based on public expenditures for an evaluation of a model performance, we tend to apply a neutral consolidation mix for macroeconomic forecasts, due to a lack of relevant information about a future fiscal policy.</p>
2	p. 34	<p><u>Follow-up on initial comment #7:</u> Total factor productivity IRF</p>	<p>I still have uncertainty about the correctness of the model's response to the TFP shock.</p> <p>It is necessary to realize that the shock is defined as permanent and therefore one would expect the permanent resulting effects on the economy. But that is not happening.</p> <p>One would expect that a permanent shock to TFP will cause companies to produce permanently more efficiently and at lower labor costs leading to an unemployment increase (the result is a decrease in long-term, why?). This should have a dampening effect on price development also considering assumed</p>	<p>I corrected a definition of model equations to obtain more plausible impulse response functions to a productivity shock. This is mostly driven by market share spillovers to an export performance in both short-term and long-term equations.</p> <p>We observe an increase in an unemployment rate and a decline in an inflation rate in a medium horizon. However, the inflation rate could increase in a short</p>

			negative impact on the output gap (in long term there is a positive impact on prices, why?).	horizon, in line with a price convergence via the Balassa-Samuelson effect.
3	p. 21	<u>Follow-up on initial comment #14:</u> Model convergence.	<p>The chapter on model convergence seems too brief to me. At the very least, it would be interesting to supplement it graphically with the historical development of the shares of components to GDP with a subsequent comparison of the convergence properties, i.e. to what shares the model converges. For example, C/Y model converges to 46%, while we know that the historical average is about 60%, in the last period about 56%. Providing a wider range of information on the development of the economy so far with a link to the model seems to be desirable (stylized facts), not only in the chapter on convergence, but generally across the WP.</p> <p>In the chart, GDP growth is permanently increasing over a very long horizon, what is the steady-state growth? It would be appropriate to add the growth of potential</p>	<p>I added historical shares of particular components to gross domestic product. While we observe an increase of both domestic export and import, in line with an increasing trade openness, this is compensated by a decline of private and public consumption.</p> <p>I added a development of potential output and employment to the figures. Actual output and employment then converge to their potential counterparts for both levels and growth rates. Convergence of domestic output is slowed down by</p>

			<p>output to GDP growth figure, assuming that they should grow at the same rate in steady-state (and probably have the same level, as in steady state the economy should produce at the potential level).</p> <p>A look at the price convergence of the model would complete the view on the convergence properties of the model.</p>	<p>very persistent capital stock in the economy.</p> <p>I added a development of price and wage variables to the chapter.</p>
4	General comments	Stylized facts	<p>Providing a wider range of information on the development and properties of the economy and linking them to the model. This could create a “story behind” of using this model to forecast economic development. How does the model match properties of the economy (not only using estimates and residuals)?</p>	<p>I added the stylized facts to both the description of model equations and the calibration of model parameters.</p>
5	General comments	Marking figures and tables	<p>What do we see in figures? I recommend adding y-labels in the figures across the document, as well as marking the graphic and tabular outputs (e.g. comparison of fiscal multipliers) and summarizing them in the form of a list.</p>	<p>I do not prefer a list of graphic and tabular outputs but I marked the graphic and tabular outputs and added x-labels and y-labels to the figures.</p>
6	General comments	Precise definition of shock	<p>I still miss a more precise definition of shocks (e.g. world crude oil price <b>increased/decreased by X%</b>).</p>	<p>I defined the shocks more precisely in both description and graphic</p>

				presentation of impulse response functions.
7	p. 3 - 4	Hyperlinks in table of content	I recommend adding links in table of content to browse the document easier.	I added hyperlinks to the table of content.
8	General comments	Inspiration	The list of used literature is rich, nevertheless I recommend focusing more on published WP of similar types of models, e.g. in within EU countries or globally, where the author could draw inspiration for the presentation of his model. This could help to improve the formal page of presented work.	I added a short description of error correction models both in the EU and outside the EU to the chapter of related literature.

## 2021\_05\_27 Follow-up comments

P.č	Pripomienka sa vzťahuje k (strana, odsek):	Text pripomienky*[3]	Odôvodnenie pripomienky	Vysporiadanie sa s pripomienkou*[4]
1	General comments	Appendix	In several parts of the work you refer to the appendix, even if there is no designation in the work. I recommend creating an appendix as a subchapter, which will contain the list of variables, equations, or even IRFs charts.	I merged the main text with the appendix to one document.
2	General comments, p. 9	Model specification	The first paragraph lacks a definition of the designation <b>cor ()</b> .	I added a definition of the designation cor().
3	General comments, p. 9	<u>Eq. (1)</u>	Is $\beta$ time varying parameter or a constant parameter? If it is constant, $\beta$ should not contain an indication of the time $t$ .	$\beta$ is a constant parameter in a model specification, as is common in related literature. However, in my opinion, it could be also a time varying parameter, if we exogenize it properly. Therefore, I prefer a more general specification. This is also a case of the capital cost parameter $\lambda$ .

4	General comments, p. 9	Word ordering	“Specifically, the first order condition <b>a</b> with <b>a</b> respect to the labour component...”	I corrected the typo.
5	General comments, p.11	Chart location, chapter 3.2.	In general, I do not recommend starting a chapter with a graph.	I moved the figure to a different location.
6	General comments	Y-labels in charts	Fig 1 - % of disposable income Fig 4 - %, title: Consumer inflation Fig 5 - % p.a. Fig 6 - % ??? Fig 7 - % p.a. Fig 8 - % (or % of labour force) Fig 9, 11, 12 - % Fig 13, 14, 15, 16 - %, title without YoY? Fig 17, 18, 19, 20, 21, 22 - % of GDP from title to y-label Fig 19 – 22 I recommend plotting entire history	I corrected the labels in the figures.
7	p. 17	<u>Follow-up on initial comments:</u> Fiscal rules are based on an expenditure side of a public budget.	In the second step of estimation process you target a structural balance from the budgetary plan under a proportional fiscal consolidation that is then distributed between <b>public revenues (50%)</b> and expenditures (50%), in line with historical shares of particular budgetary components.	The consolidation mix that is applied for macroeconomic forecasts is different from the fiscal rules that are proposed in the model, since (i) we need to target a structural public balance in contrast to a total public balance



			<p>At this point it sounds confusing to me. On the one hand you talk about consolidation exclusively through expenditures, but on the other hand revenue items are used for consolidation when making the forecast?</p> <p>Are fiscal reaction functions present in revenues equations? If not, have do you apply a consolidation mix for macroeconomic forecasts?</p>	<p>and a gross public debt and (ii) we need to obtain a target value of the structural balance in each simulation period that is not consistent with a reaction function of the fiscal rules. On the other hand, this approach does not stabilize the model in a steady state, due to an unconstrained public debt, and is thus not applicable for an evaluation of a model performance.</p>
8	p. 18	3rd paragraph	<p>I recommend not comparing the depreciation rate with the NBS, as adjustments have already been made in the case of the capital calculation and this statement may no longer be true. The statement can remain valid if you can quote a specific level of our depreciation rate from a particular document.</p>	<p>This decomposition results in (i) a higher inflation rate of domestic capital with a respect to domestic investment, in line with a changing composition of the domestic investment from buildings and dwellings to a technical equipment and (ii) a higher depreciation rate with a respect to Reľovský and Široká (2009) or Klůčik</p>

				(2015) that results from a difference between net and gross capital stock.
9	General comments, p.21	Last paragraph	Fig. 11 and Fig. 12 in brackets should be vice versa.	I switched the labels of the figures.
10	General comments, p.22	Marking of equations	Marking of equations sounds a bit confusing to me. I think that S means short run, L means long run equation. What does T and E refer to? I recommend unifying markings.	I made subchapters for the estimation of model equations and unified the markings: supply side (S), demand side (D), wage block (W), price block (P), deflator block (F)
11	p. 28	Sensitivity analysis of IRFs to a calibration of core model parameters	I miss the graphical appendix, as in the case of the analysis of other IRFs.	I added impulse response functions for the sensitivity analysis.
12	p.38-52	Notes below the charts	Deviation from baseline values should be from baseline growth.	I corrected the notes below the figures.
13	<b>I believe, taking into account the above comments, the document could be recommended for publication.</b>			

**CELKOVÉ HODNOTENIE (recenzent/ka vyplní túto časť po vysporiadaní sa s pripomienkami analytickou jednotkou):**

The author documents a structural model of the Slovak economy intended for medium-term projections and fiscal policy analysis. The core of the model is based on the AWM model from Fagan et al. (2001), being suitably extended by household's block and fiscal block based on relevant literature. The model is estimated and calibrated to fit properties of the Slovak economy. The performance of the model is evaluated based on IFRs from a series of macroeconomic and fiscal shocks.

The author dealt with the comments made in a few steps. I consider the current work to be suitable to publish.

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[1] Výber medzi: 1. analýza (komplexný analytický materiál s návrhmi konkrétnych systémových opatrení); 2. komentár (rozsahovo menší analytický materiál venujúci sa konkrétnemu čiastkovému problému); 3. manuál (metodické usmernenie vyplývajúce z potreby zjednotenia procesov a postupov v konkrétnej oblasti).

[2] Formát 1 pre komentár/manuál (2 recenzenti bez povinného odborného workshopu); Formát 2 pre analýzu (3 recenzenti a povinný odborný workshop).

[3] Do tabuľky značiť pripomienky zásadného metodologického a obsahového charakteru (nie štylistické či gramatické opravy).

[4] Vyplní analytická jednotka: pripomienka bola akceptovaná / pripomienka nebola akceptovaná a zdôvodnenie / pripomienka bola čiastočne akceptovaná a zdôvodnenie.